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Abstract

Governments that privatize state industries often retain control over key distribution assets. While there are many examples of this form of partial privatization, to our knowledge there are no substantial quantitative studies of how governments use their control under these circumstances. In this paper we argue that the Russian government privatization of the oil sector during 1994-2003 is a useful case study because the federal government privatized oil production but retained monopoly control rights over the transport of crude onto world markets. Based on a simple analysis of the costs and benefits of control and ownership, we argue that that in these circumstances the federal government would use its control over transport capacity to provide privileged access to those companies over which it has influence. We find that in 2003 this is indeed the case and that this system detracted from economic efficiency. In particular, private and regionally owned companies had to be much more productive than companies over which the federal government (the state) had influence to receive comparable access to world markets; state-influence companies had preferential access to routes with more capacity; and, the allocation of route capacity was sensitive to transport costs only in the state-influence sector.

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1. Introduction

Governments around the world have been privatizing large state owned enterprises in sectors that are of national strategic importance including oil, gas and electricity. Many of these privatizations have effectively been "partial" because national governments either manage to keep a major stake in the privatized companies or often retain control of a strategic distribution method even for fully privatized companies (Megginson, 2005). For example, the state share is remarkably large in some local gas and oil giants including Petrobras in Brazil (32%), Eni in Italy (36.9%) and Sinopec in China (77.4%). In India, the generation of electricity has been privatized, but the transmission of electricity is monopolized by government electricity boards. It has been alleged that that Indian national government uses its control over transmission to force privatized generating companies to supply electricity to poor rural areas at below-market prices and at high cost because there is poor transmission equipment and theft from the transmission lines in these rural areas (Smith, 1993).

There has been a considerable body of work on how the state uses or abuses its powers in privatization programs where it manages to obtain substantial ownership positions in privatized companies (see Megginson, 2005 for a summary). However, there are not, to our knowledge, any quantitative studies of how governments behave in a partial privatization in which they retain control over strategic distribution assets. This is surprising since there are many examples of this including the privatization of electricity in India and the small privatization program in Russia where local governments often retained *de facto* control rights by retaining *de jure* ownership of the land on which newly privatized shops operated (see Barberis et al, 1996).[1]

[1] However, for a study of how governments relinquish control over time after privatizing and its consequences for performanace, see Boubakir et al (2005).

In this paper we argue that the privatization of the Russian oil sector during 1994-2003 is a useful case study of how governments use their control rights over strategic distribution assets during a privatization. Following the demise of the Soviet Union in the 1990s, the emerging Russian federal government gained jurisdiction over the major oil fields in Russia; and, it also retained control over the transport of oil exports from both Russia and many of the newly independent countries. Starting in 1994 many former state oil companies were privatized. This privatization has been partial because the federal government has obtained ownership positions in several companies and has also retained full control over the transport of oil onto lucrative world markets. In this paper, then, we seek to understand if the state effectively uses its control over the export pipeline to discriminate between fully privatized companies and those companies in which it has substantial ownership positions. And, we check whether government control over the oil export pipeline promotes or detracts from efficiency.

The theoretical analysis in Grossman and Hart (1986) and then in Boycko, Shleifer and Vishny (1996) suggests that the federal government would tend to impose tight quotas and extract rents from companies over which it has limited influence (for herein state-independent firms) versus those over which it has influence (for herein denoted state-influence firms). The idea is that the federal government can hold up any company using its control over a key distribution asset, which in the case of the Russian crude oil sector is the transport pipeline. Companies are differentiated by their ownership rights over residual cash flows. There are fully private companies (e.g., Yukos) in which outsiders have full cash flow rights. There are other companies (e.g., LUKoil or Tatneft) where the federal government or some regional government have substantial or even close to full cash flow rights. When the federal government imposes quotas on enterprises over which it has some cash flow rights, it must also bear the financial

costs of this diversion of oil from lucrative world markets. This implies that the federal government is more likely to impose costly regulation on companies owned largely by outside investors and regional governments.

In this paper we check for the differential treatment of state-independent versus state-influence firms. We find that by 2003, in fact, state-influence firms have privileged access to state controlled export markets and that this privilege detracted from efficiency. In particular, state-independent companies had to be much more productive than state-influence companies to receive comparable access to world markets; state-influence companies had preferential access to routes with more capacity; and, the allocation of route capacity was sensitive to transport costs only in the state-influence sector.

The rest of this paper is organized as follows. The next Section describes the evolution of ownership and structure in the Russian oil sector; Section 3 describes how the federal government controls transport of oil to world markets; Section 4 sketches a simple theory of partial privatization that generates the hypothesis that export allocations are tighter in state-independent versus state-influence companies; Section 5 describes our data for testing this hypothesis; Section 6 presents our results about the differential treatment of state-independent versus state-influence companies; and Section 7 concludes.

2. Ownership and Structure

This section describes ownership trends and structural dynamics in Russia's crude oil sector. We develop a typology of company ownership based on state shares and federal government representation on company boards. We argue that Russian oil companies can be classified as either private, private with regional government influence, private with federal government influence or state companies and that it is appropriate to refer to the latter two forms

of companies as state-influence companies. We also show that the expansion of state-independent companies was more likely to be based on efficiency considerations than the expansion of state-influence companies.

2.1 Ownership. Privatization of the oil sector was regulated by Presidential Ordinance #1403 approved on November 17, 1992 (President of Russian Federation, 1992). Vertically-integrated companies (for herein, we will often use the Russian expression and call them "mothers") were created by joining some oil-producing enterprises and refineries into open-stock companies[2]. The shares of the newly-created mothers were distributed through several complex and frequently nontransparent auctions. The insiders who were allowed to participate in the bidding gained control over mothers with huge potential value in exchange for relatively small cash amounts (Megginson, 2005). Some of the smaller oil-producing enterprises were also transformed into open-stock companies and then later either became absorbed by a mother and/or had their stock allocations sold in an auction, or became joint ventures.

The privatization of the oil sector mothers during 1997-2003 was partial because the federal government managed to maintain some substantial ownership positions. As is documented in Table 1, during 1997-2003 there were three types of vertically-integrated oil companies: those fully owned by outside investors, companies where the federal government had majority or substantial minority shareholder positions (denoted **F** in Table 1) and companies where regional governments had substantial ownership (denoted as **R** in Table 1). In 1997 only four of the thirteen mothers were fully owned by outside investors, seven companies were either fully or partially owned by the federal government and two were owned by regional governments

[2] An open-stock company publicly trades its shares; a closed-stock company distributes its shares through closed subscription based on the decisions of the company's founders.

(the Repubic of Tatarstan owned 30-% of Tatneft and the Republic of Bashkotorstan owned 63-% of Bashneft).

By 1999 the federal government had managed to preserve its significant ownership positions in the crude oil production sector; and, the federal government had also placed its representatives on the Boards of Directors (herein Boards) of the companies where it had ownership. In most of the cases, the federal government representatives were from the agencies that oversaw the oil sector. For example, LUKoil's Board of 1999 included the Deputy Minister of Fuel and Energy, which at the time was responsible for allocating pipeline capacity for exports (see section 3). Another member of the Board was the top manager of the State Antimonopoly Committee, which had the responsibility of ensuring that large companies such as the oil mothers engaged in competitive business practice. Hence, federal representation on boards allowed the state not only to directly influence the mothers' decisions, but also established connections between mothers and the federal agencies with substantial influence over the crude oil sector.

The regional governments also had influence on decisions of the mothers in which they had substantial ownership positions. However, we found no evidence that the local governments had any connections to the federal agencies that supervised the oil sector. Moreover, the regional governments in Bashkortostan and Tatarstan were highly independent and often pursued policies that conflicted with federal rules (see Treisman, 1999). Thus, regional ownership and representation on the boards is not related to federal government influence.

The above analysis suggests that we can refer to state-owned mothers and mothers where federal government had significant interest as *state-influence companies*. On the other hand, regionally controlled and entirely private companies are appropriately denoted *state-independent*

companies. In other words, "state" in "state-influence" and "state-independent" companies refers to the federal government.

By 2003, federal government ownership in the oil sector had decreased. The federal government owned one vertically integrated company, Rosneft (responsible for 5% of total Russian production) and had a significant share of 7.6% in the biggest Russian oil producer LUKoil. It also had seats on the boards of these companies: ten representatives out of eleven in Rosneft and one representative out of eleven total in LUKoil. Thus, by 2003 the federal government still retained substantial influence over several major oil mothers.

2.2. Structure. The oil sector has become more concentrated over time and there have been differences in expansion dynamics for the different mothers. By the late 1990s, the mothers started aggressively acquiring new subsidiaries, merging with other oil companies and/or buying out the stocks of other shareholders in the smaller oil producing stock companies. Some mothers expanded to new oil producing regions and some mothers exited.

As a result of these expansions, Russian crude production and exports became more concentrated over time. By 2002, three firms (LUKoil, Yukos and Surgutneftegaz) were responsible for over 50% of total production and total exports: the 3-firm concentration ratio, R_3, in production grew from 0.4 in 1997 to 0.51 in 2002; R_3 in exports increased from 0.33 to 0.51 between 1997 and 2002, respectively[3] (see Table 2).

LUKoil, a state-influence company during 1997-2003, and Yukos, a state-independent company during 1997-2003, had the most aggressive expansion programs. Between 1997 and 2003 LUKoil acquired 33 new subsidiaries and Yukos obtained five new subsidiaries, including

[3] Concentration of Russian oil production sector is very high compared to other states where oil production is privatized. For example, in the United States, the third biggest oil producer in the world after Saudi Arabia and Russia, the 2-firm concentration ratio of oil production sector is 0.25; the three biggest US oil operators control only 0.33 per cent of total oil production (EIA, 2005).

one mother (VNK). However, as Table 3 documents, the expansion programs were very different. LUKoil mostly expanded its influence to two new regions, Urals, an old oil region with relatively low productivity fields, and the North (Komi), a relatively new and poorly developed oil region. As a result, in 2003 productivity of the newly acquired subsidiaries varied from 1.63 thousand tons per average well in the Urals to 8.5 per average well in Komi. Yukos, on the other hand, improved its existing position within Western Siberia, which is the most productive Russian oil region. As a result, between 1997 and 2003 Yukos's average productivity in the region increased from 2.68 to 10.78 thousand tons per well. Table 4 documents that whether we use return on assets or return on non-current (primarily property, plant and equipment), between 1999-2003 Yukos was more profitable than LUKoil. Thus, the evidence in Tables 3 and 4 suggests that between 1997-2003 the expansion policy of the state-independent Yukos was driven more by profit criteria than the expansion policy in the state-influence company LUKoil.

The expansion policies of the state-independent Sidanko and the state-influence company Rosneft are similar (we cannot make comparisons with other companies because either they change ownership between 1997-2003, and/or they do not expand). As Table 3 documents, Sidanko improved its productivity in Western Siberia from 2 to 7.4 thousand tons per well and its output in the less productive Volga region grew from 3.4 to 4.74 thousand tons per well. Fully state-owned Rosneft, on the other hand, started developing the new North region, where it achieved productivity of 28.47 thousand tons per well, while maintaining less productive subsidiaries in the worked-out North Caucasus region that produced on average 1.31 thousand tons of oil per well.

In summary, this section has made several points about ownership and structure in the Russian oil sector. First, the privatization was partial and vertically-integrated companies in the

crude oil sector can be divided into state-influence companies and state-independent companies. Second, after privatization, the oil sector was highly concentrated and its concentration increased over time. Third, companies that remained state-independent used economic criterion in their expansions in 1997-2003..

3. Control

In this section we argue that the federal government has the power to control exports because of its almost complete monopoly position as transporter of crude oil onto domestic-CIS and world markets. Because selling crude at world market is preferred to selling it domestically (due to substantial price spreads during 1997 and 2003 and non-payment problems in domestic and CIS markets), we argue that this ability to control exports gives the federal government considerable leverage over all companies.

The profits of Russian oil mothers depend very much on their crude exports. As it is documented in Table 5, in 1997-2003 mothers exported on average about 20-35% of the total crude they produced; the state-owned Rosneft consistently exported the largest share of its production compared to other mothers. One reason for the reliance on exports was the significant spread between the domestic and world prices for crude oil. According to ***The Wall Street Journal*** in February of 2003, local oil spelling prices were as low as $5 per barrel, compared to $31 per barrel on the world market (Anna Raff for ***The Wall Street Journal***, 2003.) Another reason for the reliance was that international buyers were more likely than customers in Russia and the CIS to pay in a timely fashion.

Over 95% of total crude exports from Russia are transported through a system of trunk pipelines. The system is state-owned and operated by a 100% federally-owned company,

Transneft[4]. Hence, the federal government has almost complete monopoly control over Russian oil exports. This extent of federal power is unusual. In most countries where oil production is private, oil transportation is also privately provided. For example, in the United States the system of trunk pipelines is owned and operated by over 3, 000 companies, some of which are oil producers, others have no relation to oil production (Office of Pipeline Safety Communications, 2005). This is also true for Norway where all the segments of its complex oil transportation system are operated by oil producers working in the country (Norwegian Petroleum Directorate, 2005).

According to independent experts, the Transneft pipeline system had in 2001 the capacity to ship roughly 153-154 million tons per year (Oil and Capital, 2001). Since 2002, Transneft trunk pipelines have been operating at full capacity (Oil and Capital, 2004). As a result of system overload, available throughput capacity has to be rationed between the companies. The federal government thus has tremendous control over the crude oil sector because of its ability to allocate highly valuable capacity to export.

The export quotas allocation rules were introduced in 1994 and stayed practically unchanged through 2003 (Government of Russian Federation, 1994). According to the official laws on the books, export pipeline capacity is allocated between the oil companies according to a grandfathering rule: each company's quota is determined by its production in the past quarter. In particular, the allocation quotas depend on three factors: the capacity of the Transneft system, the production of an exporter in the previous quarter and, since 1997, her tax arrears (Government of Russian Federation, 1997). This formal allocation rule does not depend on the willingness of oil producers to pay for capacity and so does not promote efficiency. The rules also appear to be

[4] As of April, 2005, 100% of common stocks of the company belong to the Federal Agency of Federal Property Management (Transneft, 2005).

quite vague as to the exact relationships between past production, route capacity and current export access.

Contrary to the unchanged allocation rules, the agencies enforcing them changed over time. Before 2000, the Ministry of Fuel and Energy and the Interdepartmental Commission (controlled by the Ministry of Fuel and Energy) were responsible for export transport allocations (Government of Russian Federation, 1995). The oil export allocation schedule was prepared quarterly by the Ministry of Fuel and Energy. It received information on the capacity of the transportation system and quotas requests of mothers from Transneft, and then sent the preliminary schedule to the Interdepartmental Commission for confirmation. The final schedule was then sent to Transneft and the mothers.

The Ministry of Fuel and Energy was controlled mostly by former Soviet officials. Berkowitz (2000) documents that in 1995-1996 access to the oil pipeline was highly political. In particular, he noted that bribes and political favors played an important role in determining the size of the final quota. Furthermore, he also found that it is difficult to separate the impact of rules from the impact of the political influence that a company enjoys from being large on export allocations.

In the spring of 2000, the Ministry of Fuel and Energy was restructured and became the Ministry of Energy, and the Interdepartmental Commission was dismissed (Government of Russian Federation, 2000). As a result of this restructuring, the Ministry of Energy lost a lot of its responsibilities to other state institutions. In particular, the main responsibility of quotas allocation was shifted to the specially created Commission of Russian Government (Government of Russian Federation, 2000) which now was controlled by one of the major players on Putin's team, the Vice Prime Minister.

Allocating export quotas between the companies is not the only way the state can control the oil producers. It is important to mention that Russian crude can be exported through several routes that are differentiated by cost. Thus, not only volume of the quota matters to a producer, but also WHERE this volume is allocated to be shipped. Specifically, Russian crude is exported through ports and the pipeline sub-system called Druzhba that delivers oil directly to European refineries (see Figure 1). Over half of the total Russian crude exports go through sea ports since exports through the Druzhba subsystem are constrained by the capacity of the European refineries to which it is connected. In 1997 four ports were exporting Russian crude: Russian Novorossyisk and Tuapse, Ukrainian Odessa and Latvian Ventspils. By 2003 three more export ports appeared: Lithuanian Baltic export terminal Butinge[5] in 1999, Russian Baltic port Primorsk in 2001 and Ukrainian oil terminal "Yuzhnyi" in 2003.

The export costs of different routes can be roughly estimated by using the costs of delivering oil to a refinery or a port and the costs of oil transshipment in the port. The costs of shipping oil are determined by the operators of the pipelines. Oil transshipment costs are separately determined in each port. They include costs of transferring oil from a pipeline to a terminal and then to a tanker. The export and transshipment costs at different export routers are presented in Table 6. The table shows that Transneft (the operator of the Russian pipeline system) offers the best transit tariffs and that working with non-Russian countries adds substantial costs. Hence, the Druzhba route to Europe is the cheapest since the producers only have to pay transit costs and avoid transshipment costs. However, because of the capacity constraints of the European refineries, this route may not be the most profitable since it allows exporting limited volumes of crude. Among the sea exporting terminals, Russian ports charge

[5] Yukos bought control of Butinge in mid-2002 from the American company Williams (Oil and Capital News, 2002a; Oil and Capital News, 2002b).

relatively small transshipment costs. This makes Russian ports the most desirable among sea export routes.

In summary, the Russian oil transport system can be characterized by the following features. First, exporting onto world markets is more lucrative than shipping onto the domestic or CIS market. Second, the Russian federal government has substantial leverage in the oil industry because it has a nearly monopoly position in allocating scarce transport capacity for world market exports. Third, the Russian federal government's procedure for allocating export capacity is unrelated to efficiency criterion and is rather non-transparent. Fourth, the allocation rules did not change much in 1997-2003. Finally, besides controlling export quotas, the federal government also controls just the allocation of company world market exports through particular export routes that are differentiated by their costs. Druzhba and Russian ports are the cheapest export routes for Russian crude, and shipping through non-Russian countries to obtain access to world markets adds substantial costs.

4. Theory

This section develops a simple theory of just how differences in ownership can influence the state allocation of export quotas to companies. In our model, there is a state regulatory body that allocates export capacity, Q, in the form of access to a pipeline route to a company. In turn, the company chooses the share of its oil output that it exports on world markets and the share that goes to the domestic/CIS market. The world price exceeds the domestic/CIS price: $P_w > P_d$. This captures two features of the Russian oil market that we have already noted: first, world prices are usually higher and, second, many domestic and CIS refineries delay or simply

withhold payments while this is not an issue on world markets. Formally, a company solves the following program:

$$Choose\ L \geq 0,\ and\ \alpha \in [0,1]: Max\ \beta\{(\alpha P_w + (1-\alpha)P_d) f(L) - L\} \qquad (1)$$

$$s.t.\ \alpha f(L) \leq Q\ ,\ where$$

L denotes a variable input such as labor, $f(L)$ is a non-decreasing, continuous and concave production function that converts L into oil output, α is the share of output that is exported on world markets, (1-α) is the share shipped to the domestic-CIS market and Q denotes the export quota. The parameter β captures ownership; when β is close to unity the company has close full rights to it residual profits after choosing L, and is categorized as state-independent. As β falls and approaches zero the company has its most of its cash flows appropriated by the federal government and is classified as a state-influence company.

In this setup, when the export quota is non-binding, the company chooses $\alpha = 1$ and exports all of its output to world markets. It also chooses L so that its marginal value product *on world markets* equals its marginal cost:

$$P_w f'(L^*) = 1\ and\ \alpha^* = 1,\ when\ f(L^*) < Q \qquad (2)$$

If the quota is binding, then $Q = \alpha^* f(L)$ and the company sells ($f(L) - Q$) on domestic/CIS market. In this case, the shadow price of the quota is $\beta(P_w - P_d)$, which is the company's revenue simply lost by shifting a unit of output sales from the world to domestic-CIS market. The company now chooses L so that its marginal value product *on domestic markets* equals its marginal cost:

$$P_d f'(L^*) = 1,\ where\ \alpha^* < 1,\ and\ f(L^*) = (Q/\alpha^*) \qquad (3)$$

Equation (3) generates several predictions about the behavior of a quota constrained company. First, since cash flow rights apply to revenues net of variable costs, an increase in

ownership rights has no impact on output or allocations of output to the world and domestic/CIS markets:

$$\partial \alpha^* / \partial \beta = \partial L^* / \partial \beta = 0$$

Furthermore, a relaxation of the quota induces a company to shift its sales from the domestic-CIS market to world markets without changing overall output:

$$\partial \alpha^* / \partial Q > 0, \ \partial L^* / \partial Q = 0$$

We use this setup to make predictions about how the federal government regulatory agency chooses its optimal quota. Our basic premise is that the federal agency is driven by political criteria, and wins loyalty, favors and transfers in-kind when it has companies deliver cheap oil to its clients on the domestic-CIS market. To capture this idea, we denote the political benefits of quotas as $Z(f(L) - Q)$, where $Z' > 0$, $Z'' < 0$. The cost borne by the federal government is the loss in revenues by diverting from the world market: $(1 - \beta)(P_w - P_d)(f(L) - Q)$. Thus, the private ownership parameter, β, influences the federal government's costs of using a quota to force a company to ship on the domestic-CIS market. The federal government can pass a higher share of its costs of foregoing world market prices to a state-independent company that has a β close to unity. However, in a state-influence company where β is much lower, the federal government picks up more of the cost.

When the quota is binding, the state chooses an optimal quota so that its marginal benefit equals its marginal cost:

$$-Z' + (1 - \beta)(P_w - P_d) = 0 \qquad (4)$$

Implicitly differentiating (4), then

$$\partial Q / \partial \beta = (P_w - P_d) / Z'' < 0 \qquad (5)$$

Thus, a binding quota becomes tighter as private ownership increases. The logic of this result is that an increase in β depresses the marginal cost of diverting oil from the export to the domestic/CIS market. This result implies that the federal regulatory agencies would use their control over the oil export pipeline to discriminate against state-independent companies. We will take this prediction to the data in what follows.

5. Data

The data were acquired from ***Oil Trade***, a statistical annex to ***Oil and Capital***, a leading magazine for the Russian oil industry. Our dataset includes subsidiary level export volumes through different routes, measures of company size, regional production costs, transportation costs and the capacity of each pipeline route. In the dataset we report the exports of 32 subsidiaries in 1997 and 54 oil subsidiaries in 2003 through each possible route (there are eight export routes, but because some routes are very close to each other, we categorize shipments into seven possible routes).

5.1. Export Volumes. Export volumes are reported in thousands of tons, and there is a negligible difference in the quality of oil exported by the subsidiaries. This is because after a company pumps oil into the transport pipeline, that oil is blended with all of the oil currently in the pipeline, so that at the final export destination oil generally priced on world markets as the Urals blend.[6] In the dataset we included exports of only those subsidiaries of mothers that reported production in 1997 and 2003, and reported production was higher than reported exports. The reason to exclude exporting subsidiaries with no reported production or reported exports

[6] The exceptions to this are exports from the Rosneft subsidiary in the Sakhalin area, which typically prices closer to Asian blends, and exports from companies using the Caspian Pipeline Consortium. However, these companies are excluded from our sample. We thank Michael Cohen from the Office of Energy Markets and End Use, the Department of Energy, for help with this issue.

higher than production is the possibility that they exported re-distributed oil. Russian mother companies can re-distribute their output intended for export between the subsidiaries, i.e., a certain subsidiary may receive additional oil, produced by another subsidiary, for export. This re-distribution does not change the receiving subsidiary's production costs, but affects its transportation costs. Since it is impossible to tell how much extra oil the subsidiary received, the actual costs of the exporting subsidiary are impossible to calculate. There was one exporting subsidiary that did not report production in 1997 and four in 2003. One in 1997 reported significantly higher exports than production; and, in 2003 all of the subsidiaries' exports were lower than reported production.

5.2. Company Size. We use subsidiaries' number of total wells and number of operating wells as measures of its size. We find that both measures are highly correlated with total production: 0.79 for the number of total wells and 0.75 for the number of operating wells. Company size can pick up the importance of size for export access, which would include ability to produce and political influence.

5.3. Company Productivity. We measure productivity as output per well and output per productive well. We would expect this variable to be positively associated with export access when access to world markets is based upon efficiency.

5.4. Regional Production Costs. We use regional producers' price (rubles per ton) as a measure of regional production costs. The oil-producing subsidiaries included in the dataset are located in six different oil regions of Russia. Regional prices capture the region-specific production costs that vary between different regions due to different climate zones (e.g., Western Siberia vs. Volga) and had different levels of oil production development (e.g., old and high cost wells in the North Caucasus region vs. new, poorly developed production infrastructure in the

North in the Komi Republic). We understand that this measure does not capture all company-specific production costs, but it is the best measure available since the mothers do not report their production costs. If access to world markets is based upon economic criteria, then we would expect that this variable would be negatively associated with exports on world markets.

5.5. Exports Routes. In 1997, Russian crude exports went through five routes (Druzhba pipeline sub-system; ports of Novorossiysk, Tuapse, Ventspils and Odessa); in 2003, the number of export routes for Russain oil was seven (Druzhba and ports of Tuapse, Novorossiysk, Primorsk, Odessa, Yuzhnyi and Butinge) (see Figure 1). We do not include the Yuzhnyi export route for 2003 since its exports account for less than 0.1% of total exports. Also, since Tuapse and Novorossyisk are located very close to each other, we unite these routes and report them as joint Tuapse-Novorossyik export route. For this route, we use total exports that went through both ports and total joint capacity of the two ports. The distance of this route is calculated as average of the distances from a subsidiary to each port.

Thus, in the dataset we look at the total of four export routes in 1997 (Druzhba, Tuapse-Novorossyisk, Ventspils and Odessa) and five export routes in 2003 (Druzhba, Primorsk, Tuapse-Novorossyisk, Odessa and Butinge). Below we describe how we use data on distance to world market on each route and tariffs to compute transportation costs. However, we also control for routes to pick up additional factors that would determine the impact of routes on export access.

5.6. Transportation Costs. We have transportation costs for 2003 only. We measure transportation costs as dollars per ton per kilometer, i.e., tariff times the distance from the subsidiary's location to the point of exit onto world markets. The tariffs per ton/km of different routes as of 2003 are given in Table 6. We use distance in km from a subsidiary to ports or points

of exit as a measure of distance from a subsidiary to a particular export point. Distance in km was defined by the shortest route from a subsidiary allocation to a port or Russian border (in case of Druzhba) along Transneft trunk pipelines. The location of a subsidiary was approximated either by location of its most productive fields or by location of its office. The information on the most productive fields was taken from mother companies' websites; the office addresses were obtained from the website of the Russian System of Full Information Disclosure and News "Skrin" (http://www.skrin.ru).

The data on the pipeline routes location was taken from Transneft's website (www.transneft.ru). To calculate distance between cities where the pipeline nodes are located, we used the AutoTransInfo website (http://www.ati.su/) that provides information on distances between Russian cities and towns along highways. We assume that the oil from a subsidiary enters the pipeline at the node-city that is closest to the location of the subsidiary. If the allocation of export capacity is related to efficiency considerations, then we would expect to observe a negative association for subsidiaries between export volumes on a particular route and transportation costs.

As a robustness check, we also use an alternative distance measure. Following Berkowitz (2000), alternative distance is measured in total numbers of Transneft regional sub-systems the subsidiary has to pump its oil through to get to the port or Russia border. The two measures are highly correlated (0.84).

5.7. Route Capacity. Route capacity is reported for 2003 only. Capacity of each export route is reported in million tons per year in Table 6. For the Tuapse-Novorossyisk route we use the sum of the capacities of the two ports. Since the export system is capacity constrained, we would expect to observe a positive association between route capacity and export volumes.

5.8. Additional controls. As additional control variables, we use route and mothers dummy variables. As previously noted, route dummy variables pick additional factors related to access besides transport costs and capacity, which could include long term relationships between a subsidiary and a particular regional Transneft company. Mother dummies pick mother-specific factors such as political connections that could be important for access.

6. Empirical Results

We have compiled detailed data on export volumes by route, regional costs, company productivity and size in 1997 and 2003. Additionally, in 2003 we have detailed data summarizing transportation costs and route capacity. Hence, we first test the prediction that the federal regulatory agencies provide preferential access to state-influence companies in 2003 only. Then, we will perform a less detailed analysis of 2003 and 1997 data and compare the results. We will show that in 2003 the state-influence companies indeed received preferential treatment, while in 1997 there was no difference in access provided to state-influence and state-independent companies.

6.1. Analysis of 2003. We set the indicator variable S = 0 for the state-independent companies and S = 1 for the state-influence companies and estimate the following model in 2003:

$$\begin{aligned} y_{pm_i} = {} & \alpha + (\alpha_1 + \alpha_2 S) * reg\_costs_{m_i} \\ & + (\alpha_3 + \alpha_4 S) * trans\_costs_{pm_i} + (\alpha_5 + \alpha_6 S) * route\_cap_p \\ & + (\alpha_7 + \alpha_8 S) * prod_{m_i} + (\alpha_9 + \alpha_{10} S) * oil\_wells_{m_i} \\ & + \gamma_{1j} route_p + \gamma_{2j} S * route_p + \gamma_{3j} mother_m + \varepsilon_{pm_i} \end{aligned} \qquad (6)$$

Here y_{pm_i} denotes thousands of tons of oil exported to world markets on the p[th] pipeline route for the i[th] subsidiary in the m[th] mother company, $reg\_costs_{m_i}$ denotes regional production

costs for the i[th] subsidiary of the m[th] mother, $trans\_costs_{pm_i}$ denotes transportation costs (dollars per km per ton) for the i[th] subsidiary of the m[th] mother on the p[th] route, $route\_cap_{\mathrm{p}}$ denotes the oil volume capacity for the p[th] route, $prod_{m_i}$ denotes productivity (measured as output per well) of the i[th] subsidiary of the m[th] mother, $oil\_wells_{m_i}$ is the number of oil wells (either total or operating) in the i[th] subsidiary of the m[th] mother and is our proxy for company size, $route_{\mathrm{p}}$ is a dummy variable for the p[th] route and $mother_m$ is a dummy variable for the m[th] mother. The odd-numbered regressors, $\alpha_1, \alpha_3, \alpha_5, \alpha_7, \alpha_9, \gamma_{1j}$ measure the estimated impact of $reg\_costs_{m_i}$, $trans\_costs_{pm_i}$, $route\_cap_{\mathrm{p}}$, $prod_{m_i}$, $oil\_wells_{m_i}$, $route_{\mathrm{p}}$ and $mother_m$ on y_{pm_i}. The even numbered coefficients, $\alpha_2, \alpha_4, \alpha_6, \alpha_8, \alpha_{10}, \gamma_{2j}$, measure the estimated differential impact of these variables on *the state-influence net o*f *state-independent sectors* and enable to test the following hypotheses:

Hypothesis 1: The state influence companies are not privileged because they cannot export more than the state-independents if their production costs are higher (the null is $\alpha_2 = 0$).

Hypothesis 2: The state-influence companies do not have privileged access to export routes because of their geographic location (the null is $\alpha_4 = 0$);

Hypothesis 3: The state-influence companies do not receive better access to routes with greater capacity (the null is $\alpha_6 = 0$);

Hypothesis 4: The state-influence companies do not receive privileged treatment because they cannot ship more than the state-independents if they are less productive (the null is $\alpha_8 = 0$).

Our sample includes 270 observations of exports by 54 subsidiaries through the five possible routes. However, there are 145 observations in which a particular subsidiary that is an

exporter does not use at least one of the five available routes. Thus, we use the Tobit procedure and censor all the export observations that are zero.

We test our hypothesis using the km distance measure (results with the alternative measure are similar and are available upon request). In Table 7 the columns entitled State-Influence Net of State-Independent present the results relevant to our hypothesis tests (i.e., $\alpha_2 = 0$, $\alpha_4 = 0$, $\alpha_6 = 0$ and $\alpha_8 = 0$). In addition, the columns entitled State-Independent and State-Influence presents estimates of the associations between our independent variables and oil exports for the subsidiaries. In each cell we first report point estimates, standard errors (in parentheses) and then quantitative significance: this is the point estimate for a regressor times its sample standard deviation; it measures the impact of a one-standard deviation increase in the independent variable on thousands of tons oil exports.

Checking column (1) in specifications 1 and 2, we fail to reject the hypothesis ($\alpha_2 = 0$) that the state influence companies are not privileged because of regional production costs. However, it is clear from columns (2) and (3) in each specification that only the state-influence subsidiaries pay attention to regional production costs. A possible explanation of this finding is state-independents face tighter capacity constraints and will export as much as the federal government allows, while the state-influence companies can be more sensitive to costs.

We reject the hypothesis ($\alpha_4 = 0$) that the state influence companies do not have preferential access due to their location at 1 % level in both specifications. Once again, the estimates in columns (2) and (3) suggest there is a major difference in treatment of state-independent versus state-influence subsidiaries. For example, the results in specification 2 imply that a one standard deviation increase in transport costs is associated with a 1.6 million ton cut in exports in the state-influence group and a 1.2 million ton increase in the state-independent group.

This suggests that the shadow price of the quota is so high for the state-independent companies that when state-influence companies reduce their exports following an increase in transportation costs, the state-independents pick up this slack capacity.

We also reject the hypothesis ($\alpha_6 = 0$) regarding access to the routes with better capacity at 1 % level in both specifications. The point estimates and the quantitative significance parameters are striking in this case. For example, in specification 2, a one-standard deviation increase in route capacity (roughly 20.8 million tons in exports per year) is associated with roughly 1.9 million tons in additional exports in the average state-independent subsidiary; the average state-influence subsidiary will export 8.3 million tons more.

Finally, we reject the hypothesis ($\alpha_8 = 0$) that there is no discrimination by subsidiary-productivity per well at the 1 % level. What is striking is that state-independents export more on world markets only if they are more productive while productivity does not matter for state-influence subsidiaries.

Thus, there is strong evidence that in 2003 state-influence companies and state-independent companies are not treated in the same way in the export allocation system. The state-independent companies are more efficient, but have relatively limited access to export routes. Moreover, since the shadow price of the export quota is high, the state-independent companies are forced to behave inefficiently and export more when the transportation costs increase and extra export capacity frees up. These results also provide evidence that federal government control over the export pipeline is detrimental for efficiency. State-influence subsidiaries, on average, are less productive and yet get more access to pipeline capacity.

6.2. Comparison of 1997 and 2003. It is interesting to check if the federal government has changed in how it has exercised control over the pipeline. We have data that enables us to

make some rough comparisons between 1997 and 2003. This is interesting since the reformist Yeltsin government was in power in 1997 while the Putin administration was firmly in control in 2003. As previously noted, we do not have the transportation costs and route capacity data for 1997 that we have for 2003. Thus, to compare 1997 and 2003, we re-estimate equation (6) for 2003 without transportation costs and route capacity variables and let route dummy variables pick up all the fixed effects of the routes. Since these independent variables are only slightly correlated with the production costs and uncorrelated with other independent variables (see Table 8), the point estimates for the impact of productivity in 2003 should not be strongly affected; however, we do expect that the estimates for regional costs will change.

Table 9 reports estimation results for 1997 and 2003 with number of total wells as a proxy of the companies' size (the results with operating wells are similar and available upon request). As expected, the point estimates for productivity per well in 2003 have not changed significantly compared to Table 7; regional production costs are changed but are not statistically significant. Consistent with our estimates from Table 7, state-influence companies have privileged access because state-independent subsidiaries must be more productive to get the same access to world markets. However, in 1997 there is no such discrimination between state-influence and state-independent subsidiaries.

This result suggests some changes in the Russian political situation between 1997 and 2003. In 1997, Boris Yeltsin was in his second Presidential term and the privatization of the crude sector was only three years old. There were rumors that on the eve of the highly contested Presidential election between Yeltsin and the communist party, several oligarchs offered Yeltsin their financial support. Several of these oligarchs (for example, Yukos's Khodorkhovsky and LUKoil's Vagit Alekperov) owned substantial interests in state-influence and state independent

companies. After Yeltsin's win in the summer of 1996, there were rumors that the oligarchs who supported Yeltsin received preferential treatment including access to under-priced blocks of state property.

By 2003 the position of oligarchs in Russia had changed dramatically. The new President Putin was following up on his election promise to eliminate corruption. Many of the oligarchs who were influential in 1997 were in exile or arrested (for example, Khodorkhovsky). Putin had also replaced most of Yeltsin's officials. In particular, in 2000 the authority to allocate export quotas was moved from the Ministry of Fuel and Energy to a new Committee headed by Victor Khristenko, Vice Prime Minister at the time. Our results are consistent with the interpretation that by 2003 the Putin administration toughened its treatment of oligarchs that operated state-independent companies while providing concessions to oligarchs associated with state-influence companies.

7. Conclusion

Subsequent to the financial crisis of 1998, GDP in Russia has grown at an impressive average annual rate of more than 6% (CIA World Fact Book, 2005). One of the major concerns with this growth record, however, is that it is driven primarily by high oil prices rather than deep structural reform (see Berglöf et al, 2003). In this paper we have documented that the Russian oil sector, which is one of Russia's most profitable sectors, is in need of substantial restructuring. Our results show that the partial privatization imposes major inefficiencies for several reasons. First, state-influence companies appear to adopt acquisitions policies that are driven by non-economic criterion. Second, the allocation of pipeline capacity is sensitive to transportation costs for state-influence enterprises, but it ignores these costs for state-independents. Third, state-

influence companies benefit more from increased capacity of the export routes. Finally, productivity is not important for access to the export pipeline for the state-influence companies.

Furthermore, the Russian federal government continues to influence the oil sector in ways that are of concern. In October 2003, the Russian federal government arrested Mikhail Khodorkovsky, the chairman of the management committee of Yukos; this was the beginning of a process by which this state-independent mother company was radically downsized. Most notably, in 2005 Yukos's biggest productive subsidiary was sold at roughly 60-percent of its market value to the state-owned mother company Rosneft. In October 2005 the state-owned natural gas monopoly Gazprom bought the state-independent mother Sibneft. Our analysis of oil transport during 1997-2003 provides evidence that partial privatization in fact has allowed the federal state to impose major distortions on the operation of a lucrative sector. We plan to analyze developments between 2003 and 2005 in future research.

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Table 1: Evolution of Corporate Governance: 1997, 1999 and 2003

Mothers	1997	1999		2003	
	Share of the State	**Share of the State**	**Representatives of Russian Government on BOD**	**Share of the State**	**Representatives of Russian Government on BOD**
LUKoil	26.6[0] (**F**)	26.2[1] (**F**)	3 out of 11 (**F**)	7.60[2] (**F**)	1 out of 11 (**F**)
Yukos	0[3]	0[3]	0	0[4]	0
Sibneft	0[5]	0[5]	0	0[6]	0
Surgutneftergaz	0[7]	0[7]	0	0[8]	0
Sidanko	0[9]	0[9]	n/a	0[10]	0
Tatneft	30.34[11] (**R**)	30.9[11a] (**R**)	5 out of 15 (**R**)	0[12]	5 out of 15 (**R**)
Onako	85 [13] (**F**)	85 [13] (**F**)	n/a	Does not exist	Does not exist
VNK	36[14] (**F**)	Does not exist	Does not exist	Does not exist	Does not exist
TNK	49.87[15] (**F**)	49.87[15a] (**F**)	n/a	0[16]	0
Bashneft	63[17] (**R**)	63[17] (**R**)	4 out of 14 (**R**)	1.34[18] (**R**)	3 out of 9 (**R**)
Rosneft	96.25[19] (**F**)	96.25[19] (**F**)	n/a	96.25[20] (**F**)	10 out of 11 (**F**)
Slavneft	77.1[21] (**F**)	77.1[21a] (**F**)	7 out of 12 (**F**)	0[22]	0
KomiTEK	21.7[23] (**F**)	1.07[23a] (**F**)	n/a	Does not exist	Does not exist
Russneft	Does not exist	Does not exist	Does not exist	0[24]	0

Notes: **R** denotes a regionally owned company and **F** denotes a federally owned company, and no notation means outside ownership

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Table 2: Concentration of Russia Oil Production and Exports, 1997-2003

		1997	1998	1999	2000	2001	2002	2003
Production	**Share of Mothers**	0.89	0.87	0.83	0.87	0.87	0.90	0.88
	R_2	0.29	0.29	0.30	0.35	0.35	0.38	0.36
	R_3	0.40	0.41	0.41	0.47	0.47	0.51	0.49
Exports	**Share of Mothers**	0.69	0.46	0.78	0.80	0.85	0.90	0.88
	R_2	0.24	0.18	0.29	0.31	0.35	0.38	0.35
	R_3	0.33	0.22	0.41	0.42	0.47	0.51	0.47

R_n -- n-firm concentration ratio

Table 3. Subsidiaries and Average Well Productivity

Region	**Mothers**	**1997**			**2003**		
		# of Producing Subsidiaries	**Reported # of Wells**	**Average Production per Well (thousand tons)**	**# of Producing Subsidiaries**	**Reported # of Wells**	**Average Production per Well (thousand tons)**
Western Siberia	LUKoil	1 (4 subdivisions)	15227	2.87	7 (+4 subdivisions)	16352	6.11
	Yukos	1	10006	2.68	5	12101	10.78
	VNK	2	3879	2.84	-	-	-
	Sibneft	1	6869	2.64	1	7997	3.93
	Surgutneftegas	1	14133	2.40	1	16964	3.18
	Sidanko	5	6837	2.00	3	3737	7.40
	TNK	3	9614	2.33	4	13277	2.55
	Rosneft	1	2195	2.04	2	2525	3.90
	Slavneft	2	3599	3.41	6	3944	6.78
	Russneft	-	-	-	2	1168	2.80
North	KomiTEK	1	1609	2.23	-	-	-
	LUKoil	-	-	-	11	3264	8.50
	Rosneft	-	-	-	2	139	28.47
Volga	LUKoil	2	1067	3.08	2	1071	20.43
	Yukos	1	5462	1.56	1	5609	2.20
	Sidanko	1	339	3.70	1	380	4.74
	Tatneft	1 (14 subdivisions)	20711	1.18	1 (14 subdivisions)	21477	1.15
	Rosneft	1	166	1.50	-	-	-
	Russneft	-	-	-	2	184	2.47
North Caucasus	Rosneft	4	4529	1.37	5	3753	1.31
Urals	LUKoil	1	4670	1.21	5	6257	1.63
	Sidanko	1	4448	1.27	2	4004	1.84
	Onako	2	2773	2.70	-	-	-
	Bashneft	1 (10 subdivisions)	16958	0.91	1 (10 subdivisions)	18505	0.65
	TNK	-	-	-	2	2885	102.50
Far East	Rosneft	1	2263	0.66	1	2320	0.71

Table 4: Profitability of LUKoil versus Yukos

Year	Return on Assets		Return on Non-Current Assets	
	LUKoil	**Yukos**	**LUKoil**	**Yukos**
1999	9.6%	20.4%	12.4%	31.4%
2000	22.4%	41.0%	32.4%	77.5%
2001	11.4%	33.2%	16.7%	80.0%
2002	8.8%	24.6%	12.4%	52.0%
2003	10.6%	21.6%*	15.0%	37.8%*

*The figures for Yukos in 2003 are calculated through September 2003 and are based on an un-audited interim report.

Notes: Return on assets (non-current assets) in year is net income at the end of the year t divided by the average value of assets (non-current assets) on December 31 of year t and year t-1. Non-current assets equity include (most importantly) the net value of property, plant and equipment; it also includes equity investees and long-term investments at cost, deferred income tax assets and other long term assets.
Sources: For Yukos, see http://www.yukos.com/New_IR/Financial_reports.asp
and http://www.yukos.com/New_IR/Financial_reports_archive.asp and download the YUKOS Oil Company U.S. GAAP Consolidated Financial Statements, from December 31, 2002, December 31, 2001, and December 31, 2000 . We also used (for 2003) the YUKOS Oil Company U.S. GAAP Interim Condensed Consolidated Financial Statement Setpember 30, 2003, which is an un-audited report that covers the first nine months of 2003. For LUKoil see http://www.lukoil.com/static_6_5id_210_.html and download the OAO LUKOIL Consolidated Financial Statements (prepared in accordance with US GAAP) As of December 31, 2002 and 2001; As of December 31, 2000 and 1999 and for each of the years in the three year period ended December 31, 2000; and As of and for the years ended December 31, 1999 and 1998

Table 5: Exports of Crude Oil as Share of Production

Mothers	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Rosneft	0.47	0.36	0.40	0.23	0.19	0.19	0.44
LUKoil	0.26	0.23	0.30	0.16	0.17	0.17	0.36
Surgutneftegas	0.34	0.13	0.33	0.17	0.18	0.18	0.34
Yukos	0.26	0.25	0.44	0.19	0.20	0.18	0.34
Sidanko	0.26	0.19	0.25	0.12	0.14	0.16	0.31
Slavneft	0.24	0.12	0.33	0.17	0.18	0.19	0.32
VNK	0.25	0.19	**n.a.**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Onako	0.24	0.19	0.26	0.07	**n.a.**	**n.a.**	**n.a.**
TNK	0.16	0.21	0.31	0.23	0.18	0.17	0.38
Sibneft	0.26	0.26	0.31	0.16	0.18	0.20	0.36
Tatneft	0.24	0.12	0.31	0.20	0.19	0.18	0.38
Bashneft	0.22	0.14	0.32	0.16	0.17	0.17	0.31
KomiTEK	0.24	0.36	0.41	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Russneft	-	-	-	-	-	-	0.41
AVERAGE PER MOTHER	0.27	0.21	0.33	0.17	0.18	0.18	0.36
TOTAL MOTHERS	**0.27**	**0.20**	**0.33**	**0.18**	**0.18**	**0.18**	**0.35**

Notes: n.a. means that these companies do not exist in a particular year.

Table 6: Costs of Export Routes for Russian Oil Producers, 2003

Port/Route	**Pipeline Route to Port/Refinery**	**Average Transit Tariff ($ per ton/km)**	**Port Transshipment Tariff ($ per ton)**	**Capacity of the Route/Port (mln tons per year)**
Druzhba (till Russian border)	Russia	.33[1]	-	62[6]
Novorossyisk	Russia	.33[1]	2[2]	45.3[7]
Primorsk	Russia	.33[1]	n/a	30[8]
Tuapse	Russia	.33[1]	2.4[2]	20[9]
Odessa	Russia-Ukraine	Through Russia: .33[1] Through Ukraine: .44[1] **Average Tariff : .39**	n/a	24[10]
Yuzhnyi	Russia-Ukraine	Through Russia: .33[1] Through Ukraine: .44[1] **Average Tariff : .39**	3.5[5]	n/a
Ventspils	Russia-Byelorussia-Lithuania-Latvia	Through Russia: .33[1] Through Byelorussia: .64[3] Through Lithuania: .9 [3] Through Latvia: .6 [3] **Average Tariff : .62**	4.7[4]	50[11]
Butinge	Russia-Byelorussia-Latvia-Lithuania	Through Russia: .33[1] Through Byelorussia: .64[1] Through Latvia: .71[1] Through Lithuania: .99[1] **Average Tariff : .67**	n/a	14[12]

Source: [1] Transneft, 2002.
[2] Marine Tariff Center. http://www.russianports.ru/novo/Tarif/35_p.htm; http://www.russianports.ru/tuap/Tarif/52_p.htm
[3] Oil and Capital, 2000.
[4] Ventspils Nafta, 2000.
[5] Caspian Energy, 2003.
[6] Energy Information Administration, 2005.
[7] Oil and Capital, 2003a.
[8] Transneft, 2003.
[9] Oil and Capital, 2003b.
[10] Odessa Matine Port. http://www.port.odessa.ua/od199.php
[11] Oil and Capital, 2002.
[12] Mazeikiu Nafta. http://www.nafta.lt/en/content.php?pid=18

Table 7: Oil Exports in State-Independent and State-Influence Subsidiaries.
Dependent Variable Is Tons (000s) of Oil Exported by Route and Subsidiary in 2003

	Specification 1			**Specification 2**		
	1	**2**	**3**	**1**	**2**	**3**
Independent Variables	**State-Influence Net of State-Independent**	**State-Independent**	**State-Influence**	**State-Influence Net of State-Independent**	**State-Independent**	**State-Influence**
Regional Costs	-2.37 (1.581) *-773.40*	0.42 (1.558) *138.26*	-1.95** (0.537) *-631.57*	-2.40 (1.623) *-780.52*	0.37 (1.599) *121.07*	-2.02** (0.544) *-655*
Transport Costs for Pipeline Route	-3.39** (0.976) *-2540.51*	1.34 (0.846) *1004.02*	-2.05** (0.539) *-1525.56*	-3.71** (1.017) *-2783.79*	1.61* (0.867) *1204.60*	-2.10** (0.544) *-1565*
Pipeline Route Capacity	263.89** (77.598) *5485.40*	80.32** (27.159) *1669.22*	344.20** (94.67) *7152.29*	309.87** (86.552) *6439.97*	90.21** (28.684) *1874.86*	400.08** (104.918) *8314*
Productivity	-22.26** (6.068) *-2012..08*	22.28** (5.894) *2013.36*	0.01* (1.25) *1.29*	-19.13** (5.486) *-1743.33*	19.20** (5.299) *1740.98*	0.07 (1.254) *6.4*
Additional Controls	Total wells, five pipeline routes and the eleven mothers			Operating wells, five pipeline routes and the eleven mothers		
Log Pseudolikeli-hood	-1153.54			-1153.91		

Notes: Results are base on a maximum likelihood estimation of a Tobit model where the dependent variable is censored at zero. All standard errors are adjusted for heteroskedasticity. There are 270 observations and ** denotes significance at the 5-% level and * denotes significance at the 10-% level. Productivity is output per well in Specification 1 and output per operating well in Specification 2.

Table 8: Correlation Coefficients

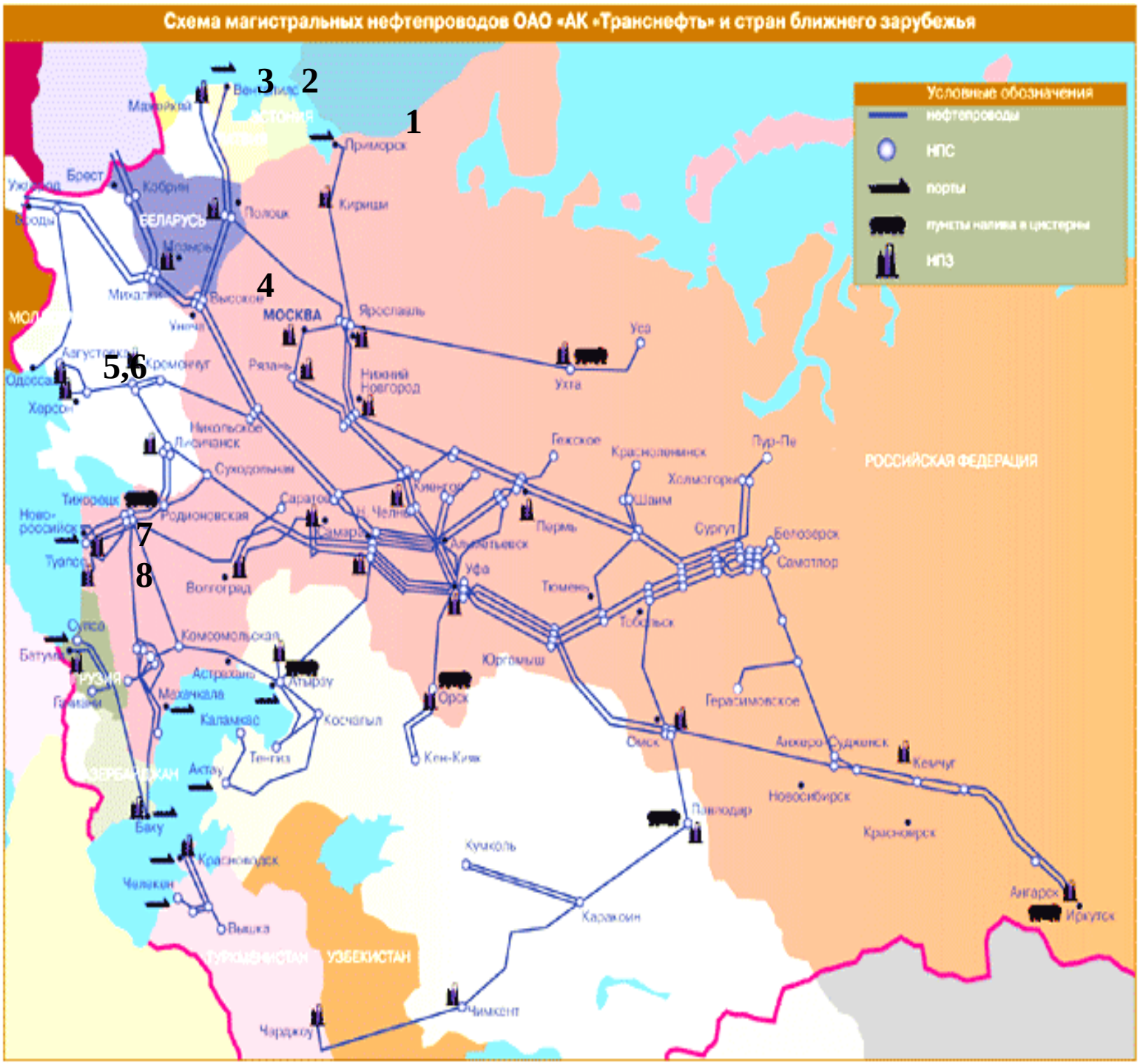
	Regional Production Costs	**Number of Wells**	**Number of Producing Wells**	**Production per Well**	**Production per Producing Well**
Transportation costs	-0.30	-0.01	-0.02	-0.08	-0.08
Route Capacity	0.00	0.00	0.00	-0.00	-0.00

Table 9: Oil Exports in State-Independent and State-Influence Subsidiaries, 1997 and 2003
Dependent Variable Is Tons (000s) of Oil Exported by Route and Subsidiary

Independent Variables	**2003**		**1997**	
	State-Independent	**State-Influence Net of State-Independent**	**State-Independent**	**State-Influence Net of State-Independent**
Total Wells (100s)	67.35** (17.7)	-37.29** (17.6)	47.62* (28.3)	-38.26 (28.3)
Operating Wells	X	X	X	X
Regional Costs	-1.34 (1.037)	0.36 (1.114)	48.04 (74.98)	-44.88 (75.01)
Productivity	18.95** (5.482)	-18.63** (5.750)	-60.97 (249.47)	74.82 (293.15)
Additional Controls	Five pipeline route used by mothers including Druzhba, Tuapse&Novorossiysk, Odessa, Butinge and Primorsk, differentiated by state-independent and state-influence companies; eleven mothers		Five pipeline route used by mothers including Druzhba, Tuapse&Novorossiysk, Odessa, Butinge and Primorsk, differentiated by state-independent and state-influence companies; eleven mothers	
Log Psuedolikelihood	-1160.74		-533.30	

Notes: Results are based on a maximum likelihood estimation of a Tobit model where the non-negative dependent variable is censored at zero. All standard errors are adjusted for heteroskedasticity. There are 270 observations for 2003 and 108 observations for 1997. ** denotes significance at the 5-% level and * denotes significance at the 10-% level. Productivity is output per well.

Figure 1. Export Routes for Russian Crude Oil.



CODE

1:	Primorsk	5, 6:	Odessa, Yuzhnyi
2:	Ventspils	7:	Novorossyisk
3:	Butinge	8:	Tuapse
4:	Druzhba		

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